

# REVISION OF THE LARVAE OF *PARATROMBIUM* (ACARINA: TROMBIDIIDAE) OF AUSTRALIA AND PAPUA NEW GUINEA, WITH NOTES ON LIFE HISTORIES

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SOUTHCOTT, R. V. 1997. Revision of the larvae of *Paratrombium* of Australia and Papua New Guinea, with notes on life histories. *Records of the South Australian Museum* 29(2): 95–120.

The larvae of *Paratrombium* Bruyant, 1910 (Acarina: Trombidiidae) of Australia and Papua New Guinea are described, from four new species: *P. australe*, sp. nov. and *P. lindsayi*, sp. nov. from southern Australia, *P. curculionis*, sp. nov. from northern Queensland, and *P. anemone*, sp. nov. from Papua New Guinea. The larvae of *P. australe* and *P. lindsayi* are correlated with adults by experimental rearing, with description of the ovum and prelarva, and attempts to find suitable larval hosts; these larvae experimentally parasitized small Diptera and Hymenoptera, and a species of Mantispidae (Neuroptera). The adults of *P. australe* and *P. lindsayi* are compared with previously described Australian adults of *Paratrombium*. Nomenclatural changes for previously described Australian adults of *Paratrombium* are proposed.

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*Paratrombium* Bruyant, 1910 was founded for a larval European mite, *P. egregium* Bruyant, 1910. Although its original author recognized its trombidioid affinities, and (1912) recorded it as a parasite of *Pompilus pectinipes* Lind. (Hymenoptera), the genus was not correlated with its post-larval instar until Feider (1952), in Europe, reared larvae from ova laid by the adult *P. divisipili* (Feider, 1950). Newell (1958) described as new two North American species, *P. bidactylus* Newell, 1958 and *P. quadriseta* Newell, 1958, which he had successfully reared from adults. Robaux (1969), in Europe, successfully reared and described larvae from an adult he identified as *P. megalochirum* (Berlese, 1910). Earlier, an uncorrelated species, *P. meruense* (Trägårdh, 1908), had been described from eastern Africa; it was redescribed by Oudemans (1912).

While the larval *Paratrombium* is well characterized and easily recognized (e. g. by being the only known trombidioid larva with a pectinate medial coxala I), the same does not apply with the adults. Hirst (1928a,b 1929) placed some Australian adults of *Paratrombium* in *Microtrombidium* Haller, 1882 and *Dinothrombium* Oudemans, 1910, and Womersley (1934) also placed some adults in *Caenothrombium* Oudemans, 1927. Among adult forms was *Caenothrombium miniatum* Womersley, 1934, for which Southcott (1986) erected *Pollicotrombium* Southcott, 1986.

In this paper four new species of *Paratrombium* are described from larvae, three from Australia and one from Papua New Guinea. The two southern Australian species, *P. australe* sp. nov. and *P. lindsayi* sp. nov., have been successfully reared from adults, and their adult and other instars are also described.

## MATERIALS AND METHODS

Adults and larvae of trombidioid mites have been collected by the author over many years, either free-living, or by extraction of samples of soil and litter with the Berlese funnel. Initial Berlese funnel extractions were into 70% ethanol; later ones were extracted free-living, for biological observation. Most collecting was done in eucalypt forests in the Mt Lofty Ranges, South Australia. A few specimens were forwarded from other collectors.

Adults used in possible rearing experiments were placed in small glass tubes, with a small amount of damp soil or bark from the collection locality; tubes were closed with well-fitting corks, with a face free from cracks, after being trimmed with a razor.

Some batches of eggs collected in the field were confined similarly, and some of these hatched into larvae. Adults died soon after oviposition and decomposed, with some mould development and

some degree of limb disarticulation; they were mounted through standard water-soluble media (initially Berlese's gum chloral medium, then polyvinyl alcohol media, and finally Hoyer's gum chloral medium). Most disarticulation of adults was mild; where severe, leg segments were recognized by shape and measurements.

Larvae swarming in the tubes were found to be positively phototropic, allowing small numbers to transfer into other tubes for experiments to find possible insect hosts for them to parasitize.

Microscopy was by Leitz Ortholux/Laborlux microscope with phase-contrast and polarizing facilities. All drawings were made with the aid of a drawing apparatus.

Seta and other anatomical terminology follows Southcott (1992, 1993, 1994).

All measurements are in micrometres ( $\mu\text{m}$ ) unless otherwise specified.

Abbreviations are as follows: SAM = South Australian Museum, Adelaide; RVS = R. V. Southcott

#### SYSTEMATICS

Family TROMBIDIIDAE Leach

Subfamily TROMBIDIINAE Leach

Trombidiidae Leach, 1815: 395 (as Trombidides)

Trombidiinae Southcott, 1986: 8

For additional synonymy see Southcott 1986: 8

Type genus *Trombidium* Fabricius, 1775.

Genus *Paratrombium* Bruyant

*Paratrombium* Bruyant, 1910: 347; Southcott 1986: 43.

For additional synonymy see Southcott 1986: 43.

Type species: *Paratrombium egregium* Bruyant, 1910.

Definition of larva: as in Southcott 1986: 43, and additionally: supracoxala present on gnathosoma and on leg I.

Definition of adult: as in Southcott 1986: 43.

#### KEY TO THE LARVAE OF *PARATROMBIUM* OF THE WORLD

1. Posterior dorsal scutum with four setae ....  
..... *P. quadriseta* Newell, 1958
- Posterior dorsal scutum with two setae .... 2

- 2 (1). Posterior claw of tarsus III not reduced ... 3
- Posterior claw of tarsus III reduced ..... 7
- 3 (2). AM setae stout, tusk-like ..... 4
- AM setae not stout, tusk-like ..... 5
- 4 (3). MA/AP 1.43–1.82. Medial coxala I with 15–20 digitations ..... *P. australe* sp. nov.
- MA/AP 1.84–2.29. Medial coxala I with c. 27 digitations ..... *P. lindsayi* sp. nov.
- 5 (3). Medial coxala I with about 17 digitations. Tritorostral setae expanded, with several blunted digitations ..... *P. anemone* sp. nov.
- Medial coxala I with less than 17 digitations. Tritorostral setae not or little expanded, with numerous fine, pointed setules ..... 6
- 6 (5). L > 200  $\mu\text{m}$ . SB > 150  $\mu\text{m}$ . Medial coxala I with 9 digitations .....  
..... *P. meruense* (Trägårdh, 1908)
- L < 200  $\mu\text{m}$ . SB < 150  $\mu\text{m}$ . Medial coxala I with 12–13 digitations .....  
..... *P. curculionis* sp. nov.
- 7 (2). Tritorostral setae of gnathosoma slender, tapering throughout .....  
..... *P. bidactylus* Newell, 1958
- Tritorostral setae of gnathosoma not slender and tapering ..... 8
- 8 (7). Medial coxala I with 14–16 digitations .....  
..... *P. megalochirus* (Berlese, 1910)
- Medial coxala I with less than 13 digitations ..... 9
- 9 (5). Tritorostral setae moderately thickened in their central part, with a heavy coating of short setules; setae of posterior dorsal scutum placed before middle of scutum; SB < PW ..... *P. egregium* Bruyant, 1910
- Tritorostral setae apparently considerably thickened with long setules, so that they appear markedly enlarged in their distal half; setae of posterior dorsal scutum placed behind middle of scutum. SB not < PW ..... *P. divisipili* (Feider, 1950)

\* This criterion is assumed to be the case with *P. meruense*; according to Oudemans (1912: 97) the holotype larva (the sole specimen) lacked the gnathosoma.

*Paratrombium australe* sp. nov.  
(Figs 1A, B, 2A–D, 3, 4A–G)

*Material examined*

Holotype. South Australia. Myponga, reared larva ACB294L3, reared 29.xi.1947, from ova laid by adult ACB294A, R.V. Southcott. SAM.

Paratypes. South Australia. Myponga, 12.x.1947, adult female ACB294A, also reared larvae ACB294LI–2, 5–8 (see details under Biology). Workanda Creek, National Park, Belair, 27.x.1951, many ova, from which larvae emerged, R.V.S., ACB546 (see under Biology). Adult ACB585A, with idiosoma length 2130, width 1260, 30.viii.1953, RVS, which laid ova which produced many larvae, including ACB585LI–12 (see Biology). SAM.

*Diagnosis of larva*

Posterior dorsal scutum with two setae. Posterior claw of tarsus III not reduced. AM setae thickened, pointed, tusk-like. Medial coxala I with 15–20 digitations. Odontus strongly curved, diverging into two well-separated tines. Tritorostral setae curved, pointed, with a brush of fine setules in distal 2/3. MA/AP 1.43–1.82.

*Diagnosis of adult*

PDS to c. 100µm long.

*Description of holotype larva* (Figs 1A,B, 2A–D), supplemented by paratypes

Colour in life red. Idiosoma 420 long by 215 wide; total length to tip of cheliceral blades 450.

Anterior dorsal scutum porose, smooth; anterior border rounded (a slight anterior central depression appears to be an artefact of mounting), lateral and posterior borders almost straight, smooth; posterolateral angles rounded. AM scutalae stout, smooth, pointed, tusk-like; other scutalae of anterior scutum tapering, pointed, thinner, AL setae smooth, PL setae with a few fine setules. Sensillary setae filamentous.

Posterior dorsal scutum (scutellum) porose, semicircular, with smooth borders; anterior border straight, anterolateral angles rounded, posterior border convex; with two scutalae similar to PLs of anterior dorsal scutum.

Metric data as in Table 1.

Each eye pair posterolateral to anterior dorsal scutum; eyes rounded, anterior 11 across, posterior 7.

Dorsum of idiosoma behind scutellum with c. 20 setae, strong, tapering, pointed, with slender, outstanding setules; each seta arising from a

conical papule; setae arranged 2, 2, 6, 2, 4, 2, 2 (pygosomals).

Ventral surface of idiosoma (Fig. 2A): between coxae III two slender, pointed setae, 70 long, with slender setules. Behind coxae III are eight setae, similar to dorsals, arising from papillae, 70–75 long, arranged 2, 4, 2 (pygosomals).

Legs of usual trombidoid stature. Leg lengths (including coxae and claws): I 475, II 450, III 490. Medial coxala I 65 long, bearing 15–16 long, thin, pointed digitations, arising somewhat obliquely to main axis (Fig. 2C). Lateral coxala I arises at anterolateral angle of coxa, slender, pointed, c. 90 long, with a few long, slender setules; above posterior cornu of coxal joint a thin, pointed supracoxala, 13 long. Urstigma at posterolateral angle of coxa I, narrow, curved, 36 long by c. 15 wide. Coxa II with two slender, pointed setae with a few slender setules; anterior seta 73 long, posterior seta 75 long. Coxala III similar, 80 long. Leg scobalae curved, tapering, pointed, with slender setules. Scobalar formula (legs I, II, III): Fe 5, 4, 4, Ge 4, 3, 3, Ti 5, 5, 5.

Leg specialized setae: SoGeI.26d(40), SoGeI.57ad(33), VsGeI.73d(9), SoTiI.49d(33), SoTiI.79d(27), VsTiI.88pd(c.5), SoGeII.45d(36), VsGeII.83d(10), SoTiII.33d(c.33), SoTiII.63d(c.23); Vs absent. SoGeIII.44d(27).

Tarsus I with SoTaI.56d(34), FaTaI.59ad(c.2), SeTaI.74d(43) ('tectal eupathidala'), Pt 20 long. Tarsus II with SoTaII.46d(c.27), FaTaII.46pd(2). Tarsal claws smooth, falciform, equal; empodium of each tarsus over-reaching claws.

Gnathosoma: combined cheliceral bases spindle-shaped, 78 long by 58 across. Cheliceral digits curved, 46 long, with apical 'chisel end'. Tritorostral setae simple, curved, pointed, c. 13 long. Deutorostral setae absent. Tritorostral setae (Fig. 2B) curved, 25 long, with a brush of setules in distal 2/3. Behind posterior margin of palpal trochanter a simple, pointed seta (blunted in holotype) (palpal supracoxala) 4–5 long.

Palpi compact; femur with dorsal, simple, pointed seta 13 long. No genual setae. Tibia with three simple setae. Odontus strongly curved, with two divergent tines (Fig. 2D). Palpal tarsus with six pointed setae, three with a scythe-like appearance, also one or two minute blunted projections (?solenoidae).

*Description of adult female ACB294A, slide-mounted, supplemented by ACB585A* (Figs 3, 4A–F)

Colour in life red. Idiosoma 3400 long by 2000 wide; total length to tip of cheliceral blades 3750.

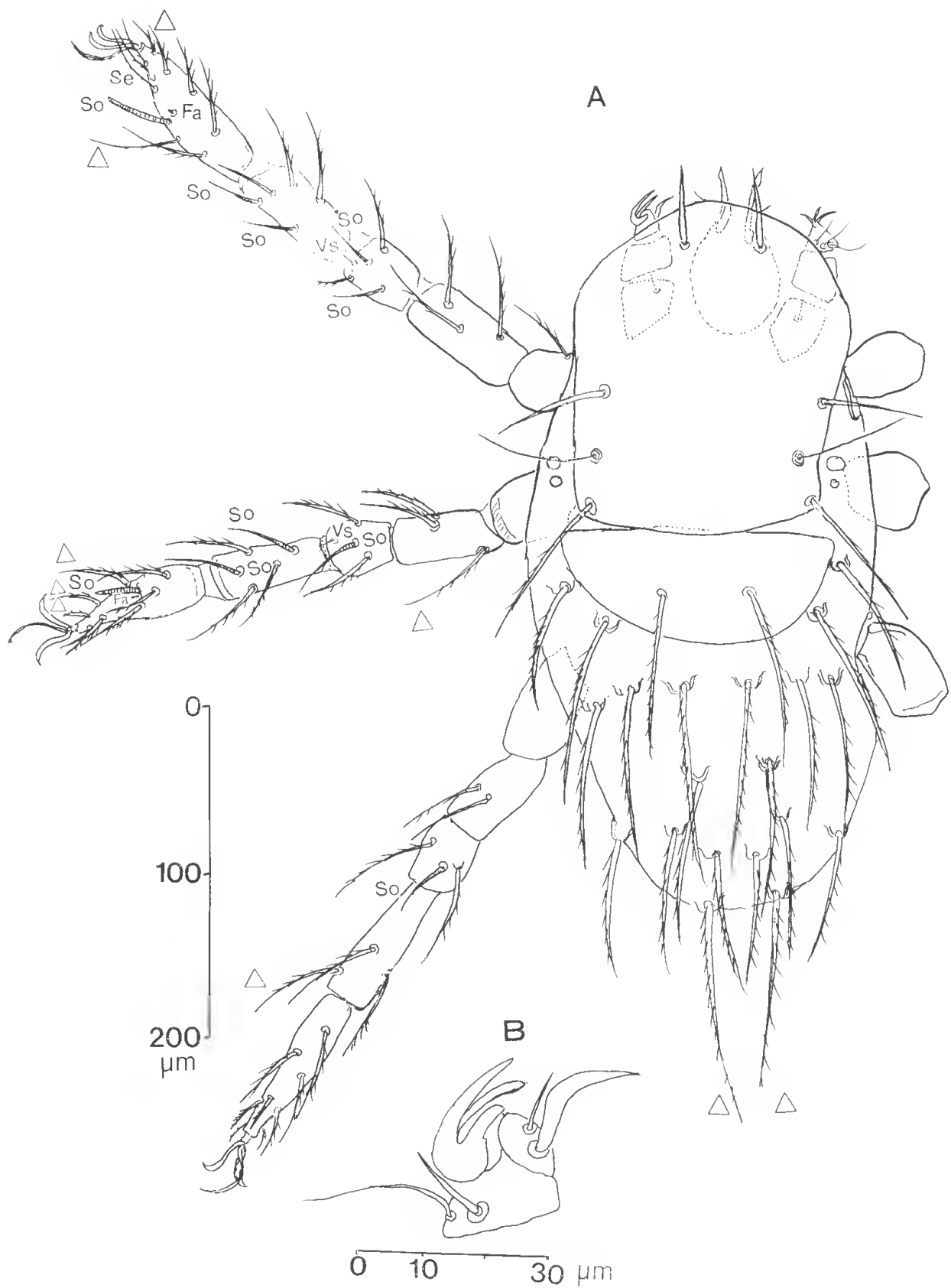


FIGURE 1. *Paratrombium australe* sp. nov., larva, holotype. A. Dorsal view, to standard symbols; on right, legs omitted beyond trochanters. B. Palpal tibia and tarsus, dorsomedial aspect, further enlarged.



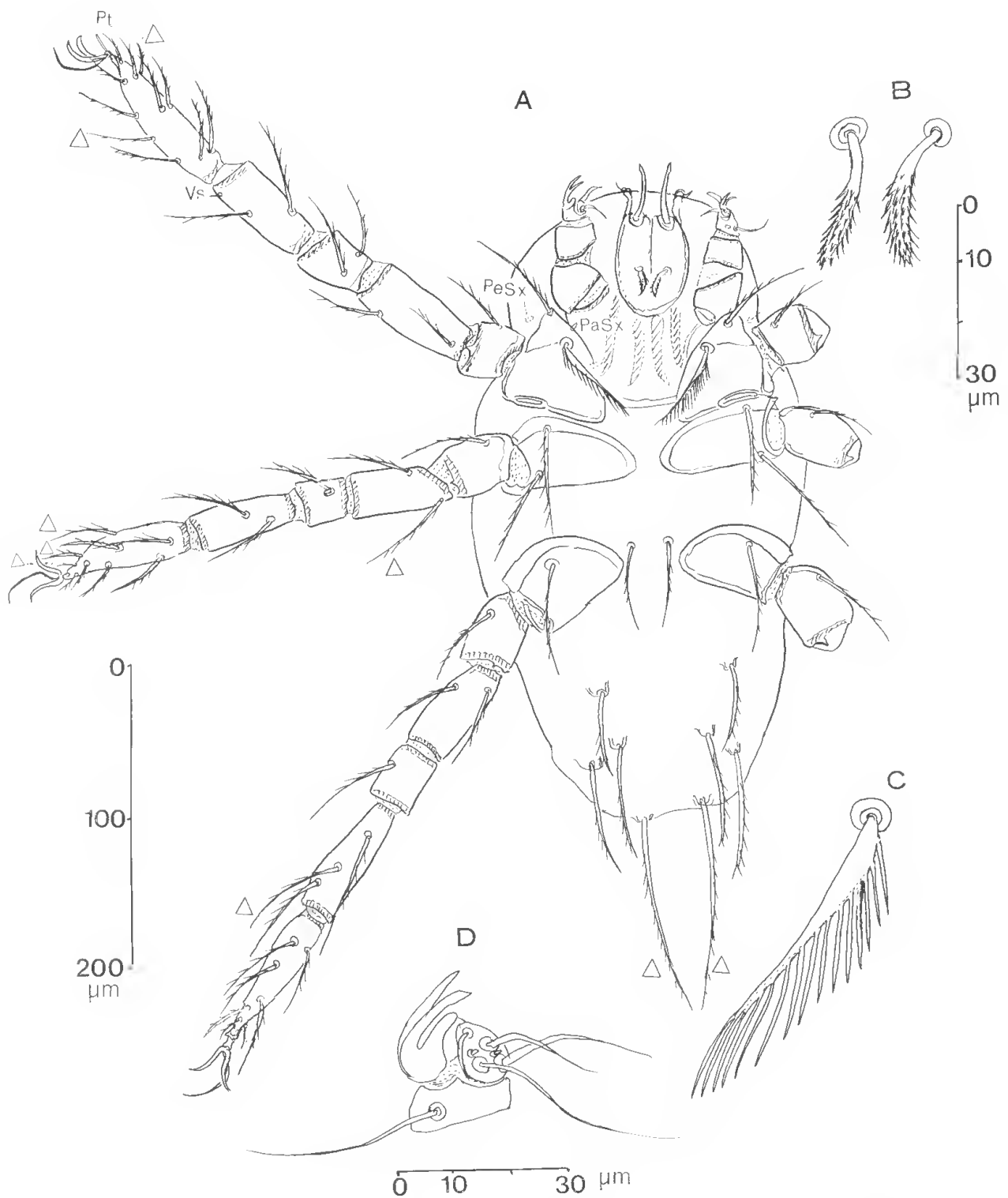


FIGURE 2. *Paratrombium australe* sp. nov., larva, holotype. A, Ventral view, to standard symbols; on right, legs omitted beyond trochanters. B, Tritorostral setae. C, Medial coxala I. D, Palpal tibia and tarsus, ventrolateral aspect. (PaSx palpal supracoxala; PeSx pedal supracoxala). (Each to nearest scale.)

Crista well developed, with strong, broad, crescentic, transverse anterior extension ('vomer') carrying pointed setulose setae 28–42 long in its anterolateral parts; more posteriorly the vomer is poorly defined, and carries similar setae to 150

long (Fig. 4A). Sensillary setae filiform, arising from a well-defined expansion of the crista; posterior end of crista well-defined, blunt-ended. Each eye pair on a large peduncle, with a lens, at about the middle, 64 across and a distal eye 60

TABLE 1. Metric data of *Paratrombium australe* sp. nov., larvae (\* for maximum values).

Character	Population from topotype area, Myponga, S.A.						Population from Workanda Creek, S.A.					
	Holotype	n	range	mean	s.d.	c.v.	n	range	mean	s.d.	c.v.	
LN	27	7	22-27	24.4	2.15	8.5	12	19-24	22.0	1.13	5.1	
MA	98	7	97-104	100.6	2.94	2.9	12	93-105	99.8	3.47	3.5	
AW	136	7	133-143	137.4	3.41	2.5	12	126-135	130.8	2.93	2.2	
PW	136	7	127-143	134.6	5.03	3.7	12	125-139	132.2	4.30	3.3	
SB	114	7	114-125	117.6	3.60	3.1	12	107-118	113.3	3.68	3.2	
MSA	91	7	85-92	89.3	2.63	2.9	12	82-95	89.8	3.74	4.2	
ASB	149	7	144-153	148.1	3.58	2.4	12	139-151	145.8	3.19	2.2	
PSB	46	7	40-46	42.0	2.08	5.0	12	38-45	40.6	2.39	5.9	
L	195	7	184-195	190.1	4.56	2.4	12	182-192	186.3	2.87	1.5	
W	176	7	172-178	175.0	2.31	1.3	12	162-170	165.5	3.26	2.0	
AP	61	7	59-62	60.6	3.21	5.3	12	59-67	63.9	2.71	4.2	
SA	31	7	31-34	33.3	2.36	7.1	12	31-40	34.5	2.81	8.2	
SP	34	7	27-34	29.9	2.61	8.7	12	25-34	31.5	2.39	7.6	
AM	45	7	44-48	45.6	1.27	2.8	6	38-45	43.3	2.73	6.3	
AL	53	7	47-57	52.3	3.20	1.9	12	44-56	48.2	3.90	8.1	
PL	82	7	80-93	84.0	5.57	6.7	12	77-93	84.2	5.01	5.9	
AMB	47	7	43-48	45.9	1.77	3.9	11	38-46	42.7	2.15	5.0	
SE	75	7	60-73	66.4	5.80	8.7	10	62-77	70.0	4.67	6.7	
PLN	42	7	40-46	43.4	2.30	5.3	11	38-47	42.9	2.43	5.7	
PSL	74	7	71-78	74.0	2.16	2.9	11	69-74	72.2	1.89	2.6	
PSW	164	7	159-166	162.9	2.91	1.8	12	152-164	157.1	3.20	2.0	
QW	53	7	50-58	53.4	2.51	4.7	12	43-55	50.1	4.36	8.7	
QL	91	7	81-91	84.6	3.87	4.6	12	69-85	79.8	4.69	5.9	
DS	77-160	7	144-160*	151.7*	6.78*	4.5*	12	141-158*	150.9*	6.13*	4.1*	
MDS	80	7	75-82	81.0	2.89	3.6	12	68-90	77.8	7.28	9.4	
PDS	160	7	144-160	151.7	6.78	4.5	12	141-158	150.9	6.13	4.1	
AW/QW	2.57	7	2.33-2.72	2.58	0.131	5.1	12	2.31-3.07	2.66	0.222	8.4	
PSL/PLN	1.76	7	1.58-1.88	1.71	0.103	6.0	11	1.59-1.83	1.69	0.0890	5.3	
Fel	91	7	96-93	90.6	2.37	2.6	12	86-98	90.7	3.87	4.3	
Gel	51	7	51-60	55.1	2.61	4.7	12	51-57	53.3	1.97	3.7	
Til	82	7	78-82	81.6	4.47	5.5	12	82-90	84.4	2.61	3.1	
Tal(L)	110	7	107-113	110.3	2.14	1.9	12	109-118	115.1	3.34	2.9	
Tal(H)	54	7	29-34	32.0	1.73	5.4	12	26-30	27.6	0.996	3.6	
Til/Gel	1.61	7	1.42-1.61	1.48	0.0678	4.6	12	1.49-1.64	1.59	0.0478	3.0	
FelI	77	7	75-77	76.1	0.900	1.2	12	70-83	77.1	3.75	4.9	
Gell	43	7	43-47	44.3	1.60	3.6	12	42-48	44.3	1.83	4.1	
Till	77	7	71-77	74.4	2.30	3.1	12	73-82	77.2	2.95	3.8	
Tall(L)	96	7	95-99	96.7	1.38	1.4	11	95-104	100.5	2.94	2.9	
Tall(H)	26	7	25-27	25.9	0.690	2.7	12	22-25	23.1	0.996	4.3	
Till/Gell	1.79	7	1.57-1.79	1.68	0.0819	4.9	12	1.52-1.85	1.74	0.0844	4.8	
FellI	83	7	82-85	83.1	1.21	1.5	12	82-92	85.8	2.89	3.4	
GellI	46	7	46-51	47.6	1.90	4.0	12	48-53	48.8	2.82	5.8	
TillI	93	7	88-95	90.7	2.81	3.1	12	87-96	92.3	2.83	3.1	
TallI(L)	102	7	93-107	101.3	4.50	4.4	12	93-111	103.4	5.25	5.1	
TallI(H)	24	7	22-24	23.0	0.577	2.5	12	18-23	20.8	1.54	7.4	
TillI/GellI	2.02	7	1.78-2.02	1.91	0.0963	5.0	12	1.75-2.13	1.89	0.105	5.5	
SA/SP	0.91	7	0.91-0.23	1.12	0.116	10.3	12	0.91-1.33	1.10	0.173	15.7	
AW/AMB	2.89	7	2.83-3.16	3.00	0.139	4.6	11	2.89-3.52	3.11	0.191	6.1	
QL/QW	1.72	7	1.41-1.72	1.59	0.108	6.8	12	1.45-1.93	1.60	0.164	10.2	
PSW/QW	3.09	7	2.74-3.18	3.05	0.146	4.8	12	2.82-3.63	3.16	0.270	8.6	
MA/AP	1.61	7	1.48-1.62	1.66	0.128	7.7	12	1.43-1.71	1.51	0.910	5.8	

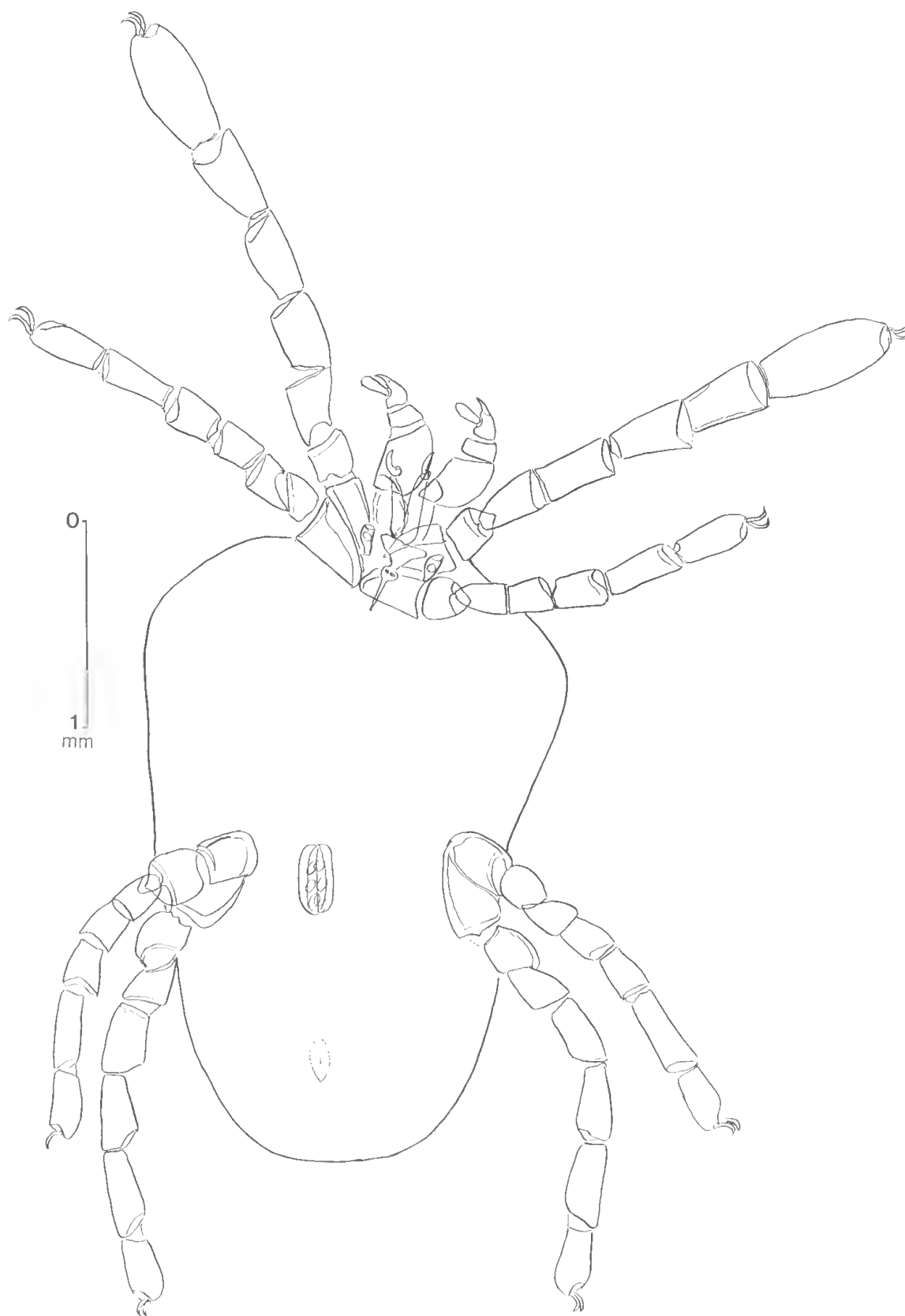


FIGURE 3. *Paratrombium australe* sp. nov., adult female, paratype, in transparency, setae omitted.

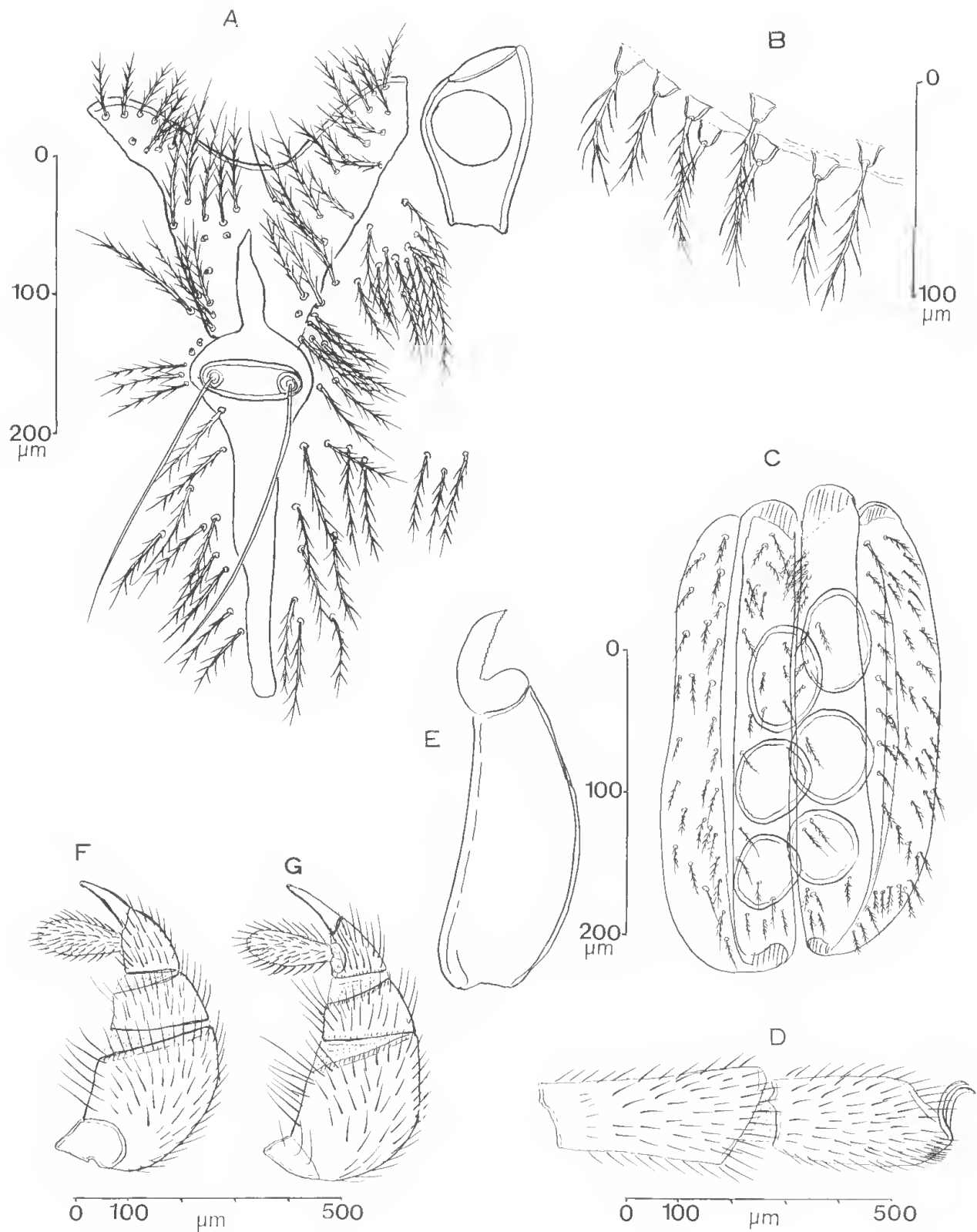


FIGURE 4. *Paratrombium australe* sp. nov., adult female, paratype. A. Crista and adjacent structures. B. Posterior dorsal idiosomal setae. C. External genitalia. D. Tibia IV and tarsus IV. E. Palp, dorsomedial aspect. F, Palp, ventrolateral aspect. (Each to nearest scale.)

across, terminal.

Dorsum of idiosoma thickly invested with pointed, tapering, well setulose setae (Fig. 4B).

Metric data as in Table 2.

Venter of idiosoma with setation similar to dorsal. External genitalia (Fig. 4C) oblong in outline, with rounded angles, 375 long by 220 wide; valves carry numerous setulose setae; genitalia with three pairs of subequal acetabula; anterior acetabulum oval, 82 x 55, middle oval

73–80 x 60–65, posterior near-circular, 65 x 45 and 60 x 58. Anus about 160 long by 60 wide.

Legs shorter than idiosoma; lengths (trochanter to claw tips: I 2665, II 1850, III 1865, IV 2270. Legs thickly invested with pointed, setulose setae. Tarsal claws smooth, falciform, about equal in size over legs I–IV.

Gnathosoma: chelicerae (Fig. 4E) robust, bases 230 long by about 110 wide (combined). Cheliceral digits falciform, 86 long, with fine dorsal denticles. Palpi (Fig. 4F,G) robust, all segments heavily invested with pointed, setulose setae. Palpal tibia with blunted odontus, but without paradonts or spinisetae. Palpal tarsus elongate-ellipsoid, 170 long by 75 wide, over-reaching odontus.

TABLE 2. Metric data of *Paratrombium australe* sp. n., adults (CL = crista length; VW = vomer width).

Character	Described specimen ACB294A	Specimen ACB585A
CL	468	—
VW	256	331
ASB	222	229
PSB	246	—
SB	62	66
SE	c. 230	275
EPL	155	195
EPW	83	85
MDS	70–100	c. 80
PDS	70–100	c. 100
Gel	440	540
Til	485	540
Tal(L)	684	735
Tal(H)	275	324
Til/Gel	1.08	1.00
Tal(L)/Til	1.43	1.36
Tal(L)/Tal(H)	2.48	2.27
GeII	310	360
TilI	410	480
TalI(L)	410	490
TalI(H)	175	180
TilI/GeII	1.32	1.33
TalI(L)/TilI	1.02	1.02
TalI(L)/TalI(H)	2.52	2.72
GeIII	297	333
TilII	441	490
TalII(L)	345	440
TalII(H)	180	180
TilII/GeIII	1.48	1.47
TalII(L)/TilII	0.78	0.90
TalII(L)/TalII(H)	1.92	2.44
GeIV	425	490
TilIV	454	684
TalIV(L)	367	440
TalIV(H)	184	209
TilIV/GeIV	1.07	1.40
TalIV(L)/TilIV	0.81	0.64
TalIV(L)/TalIV(H)	1.99	2.11

#### Description of ovum

Colour red or pink; smooth, polished, spheroidal, about 300–350 long by 250 wide (estimated from egg-skins of ACB294 and ACB585).

#### Description of prelarva

Colour red; appearance normal (size not measured).

#### Etymology

The specific name *australe* is an adjective, signifying that all specimens described originated in southern Australia (in fact, a limited area in South Australia).

#### Remarks

Table 2 gives the metric data of two adult females of *P. australe*, both of which produced ova which hatched to larvae, and used in the metric data of Table 1. See below on the discussion of the taxonomy of the adults of *Paratrombium*.

#### Biology

Two adult females of *P. australe* have been captured in the field, ACB294A and ACB585A, from which larvae were reared experimentally. In addition, batches of ova have been collected in the field, from which larvae of *P. australe* emerged. Details of these successful rearing experiments are as follows.

**Experiment ACB294:** Two adult mites were captured in close proximity on 12.x.1947. The larger one was the female ACB294A, and the smaller one ACB295 (assumed to be a male), from among damp bark in eucalypt forest (now the Nixon-Skinner Reserve). They were placed

together in a small tube with some damp soil from the site of capture.

On 17.x.1947 I recorded 'The female mite is resting on the cork, its abdomen somewhat shrunk. The male mite is resting on the glass, alongside the female, its front legs touching the front legs of the female. Not in coitus. On the damp bark is a large mass of light orange-red eggs, some hundreds. [They are] smooth, spheroidal, polished. The volume of the eggs is about twice the volume of the female! Yet they are so obvious as a body that they have obviously been laid by the large mite. Eggs are of uniform colour throughout the mass. Even if the smaller mite is not a male, none the less the eggs belong to the larger mite.'

On 26.x.1947 it was recorded that no further ova had been laid, and the ova remained undifferentiated. The smaller mite had been seen over the previous few days mounted on the back of the female.

On 2.xi.1947 the adults appeared healthy. A few ova were showing the 'earliest signs of colour differentiation', i.e. one side darker, the other lighter. There were a few mould filaments on the ova.

On 9.xi.1947 the ova were not further differentiated, and no further ova had been laid. The smaller mite was immobile, probably dead. On 14.xi.1947 the ova had become irregular in shape, and were recorded as containing developing legs. The smaller mite became mouldy, and was removed from the tube and preserved. The female mite was recorded as 'sluggish'.

Thereafter the deutova ('eggs') were observed daily. The developing legs became more prominent, and the eye spots developed. On 29.xi.1947 several larvae emerged; seven were mounted. On 30.xi.1947 a further group of larvae (about 20) had emerged. The adult female remained alive, but was not parasitized by the larvae; on 5.xii.1947 her movements were uncoordinated, and by 9.xii.1947 she had died. All larvae had emerged by 9.xii.1947, and were recorded as active and healthy. Their strongly positive phototropism (to both suffused natural and artificial (tungsten) light) allowed batches to be transferred to other tubes in efforts to find suitable arthropod hosts. As possible hosts small beetles, a mantispa, various Diptera, Jassidae (Hemiptera) and an immature locust were offered. Of these, the larvae attached only to the mantispa.

**Experiment ACB585:** A large adult was captured running across the ground on

30.viii.1953, and placed in a tube with some local soil. On 30.x.1953 (the next recorded observation) the adult was dead, and the tube contained also 'a loose aggregate of red eggs' in an advanced prelarva stage. A number of these emerged to larvae. The tube was allowed to dry out, and the adult and larvae later mounted by standard procedures.

**Experiment ACB546:** A batch of ova was collected from soil on 27.x.1951, and placed in a small tube with some local soil. A month later (25.xi.1951) they were recorded as pink, smooth and unshrunk. On 5.xii.1951 a few ova were observed to be in the prelarva stage 'but most are not'; all were unhatched; a few were mouldy. On 10.xii.1951 all had transformed to prelarvae; they were still in this stage on 21.xii.1951. On 23.xii.1951 'five larvae have hatched; others unhatched'.

On 25.xii.1951 'Tube is swarming with larval trombidids'; a few ova were still unhatched. I added a green-eyed lacewing (Neuroptera, Chrysopidae) to the tube. It promptly ate several larvae, and was not attacked by them.

A series of attempts to find suitable host arthropods was made. As before, this was made possible by the larvae being 'attracted to light'. Larvae successfully parasitized adults of *Musca domestica* L. (head, neck, thorax, abdomen, wings, legs), also other smaller Diptera, including a small hover fly (Syrphidae), as well as a small golden-green wasp, but not a thysanuran (Lepismatidae), a jassid (*Typhlocyba* sp., Hemiptera) or various other small Hemiptera. Although some of the larvae fed on their hosts and increased in size, none progressed to a later instar.

Two other batches of ova (ACB545 and ACB547) were collected at the same site, but in captivity became mouldy and did not transform to prelarvae.

In summary, ova are laid in October–November in the South Australian areas studied. They develop into prelarvae in some weeks, and larvae emerge in November–December. No larva has been captured ectoparasitic on an arthropod in the field, but experimentally they will parasitize Diptera, small Hymenoptera and a species of Mantispidae.

*Paratrombium lindsayi* sp. nov  
(Figs. 5, 6A–F, 7, 8A–F)

*Material examined*

Holotype. South Australia: Glenunga,

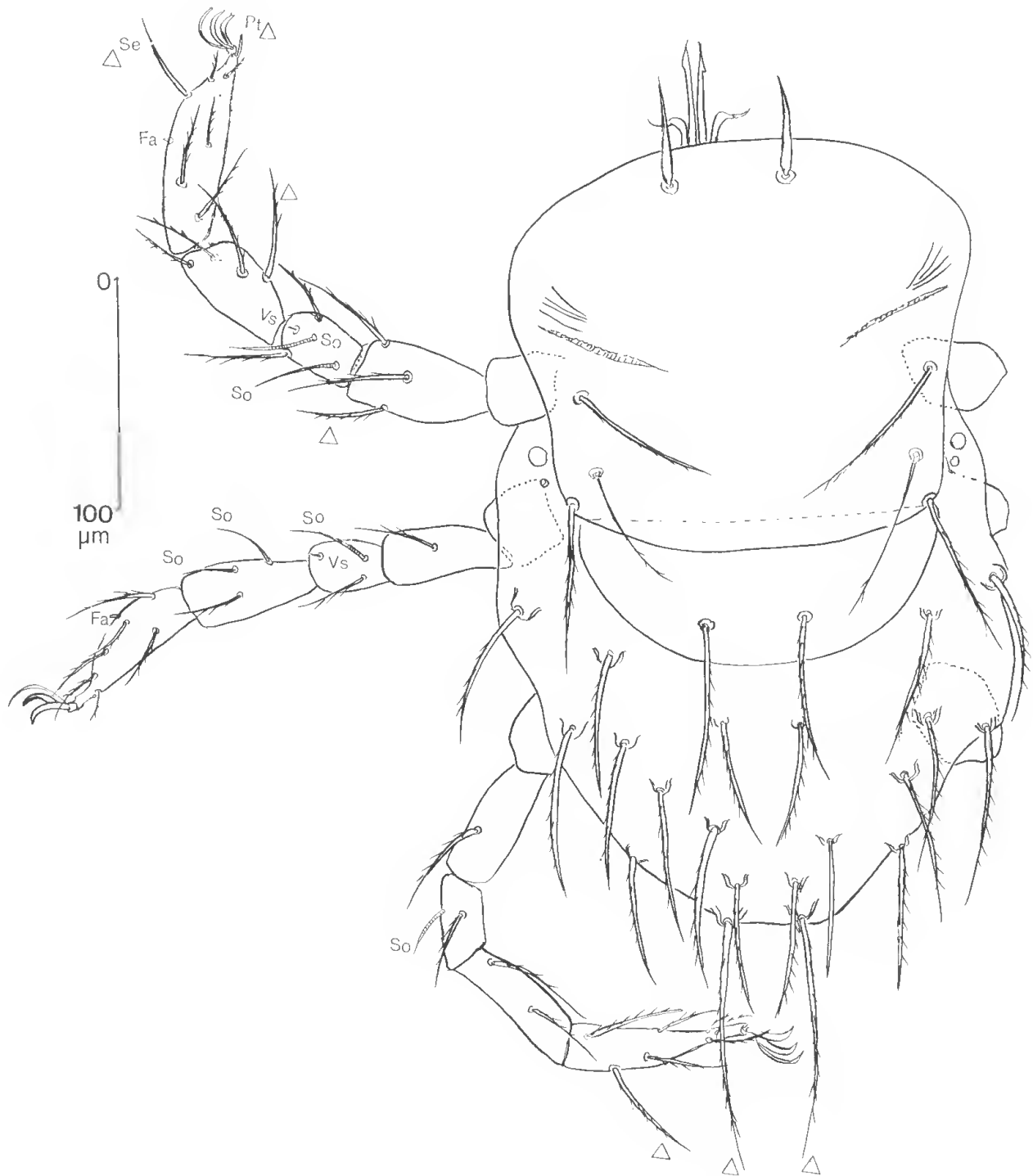


FIGURE 5. *Paratrombium lindsayi* sp. nov., larva, holotype. Dorsal view, to standard symbols; on right, legs omitted beyond trochanters.

November, 1951, reared larva ACB549L3, reared from ova laid by ACB549A, A. Lindsay Southcott. SAM.

Paratypes. Same locality and collector, adult female ACB549A, 28.x.1951; reared larvae (as for holotype) ACB549L1, 2, 4–8. SAM.

#### *Diagnosis of larva*

Scutellum with two setae. Posterior claw of tarsus III not reduced. AM setae thickened, pointed, tusk-like. Medial coxala I with 27–28 digitations. Odontus strong, curved, with two diverging tines. Tritorostral setae curved, pointed,

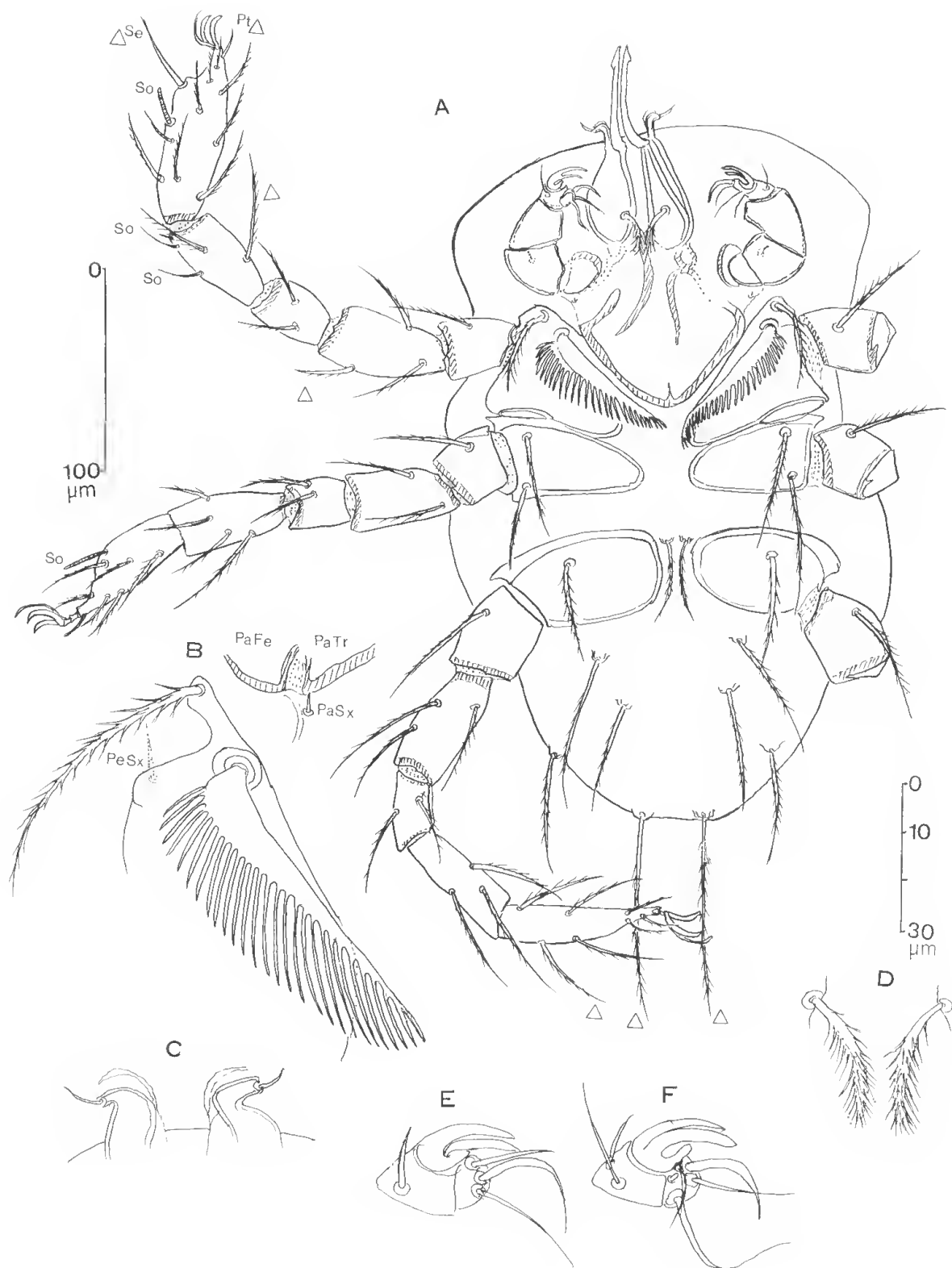


FIGURE 6. *Paratrombium lindsayi* sp. nov., larva, holotype, to standard symbols. A. Ventral view, on right legs omitted beyond trochanters. B. Medial coxala I and adjacent structures. C. Tip of rostrum and protorostral setae. D. Tritorostral setae. E. Palpal tibia and tarsus, dorsomedial aspect. F. Palpal tibia and tarsus, ventrolateral aspect. (PaFe palpal femur; PaTr palpal trochanter; PaSx palpal supracoxala; PeSx pedal supracoxala). (A to scale on left; B–F to scale on right.)



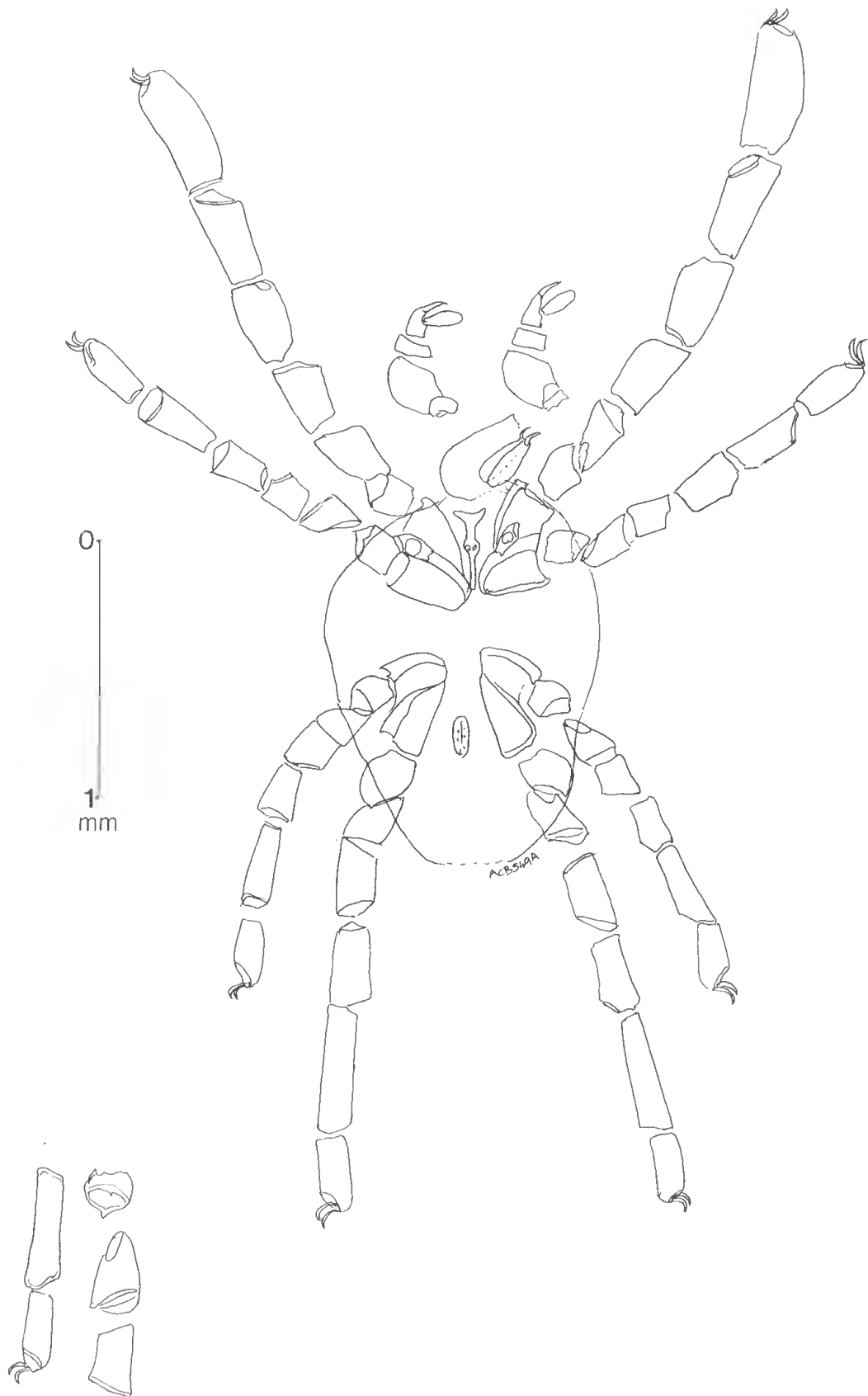


FIGURE 7. *Paratrombium lindsayi* sp. nov., adult female, paratype. In transparency; figure assembled from largely disarticulated pieces; inset: surplus fragments of another adult trombidoid present in the experimental tube (see text). (All to scale shown.)

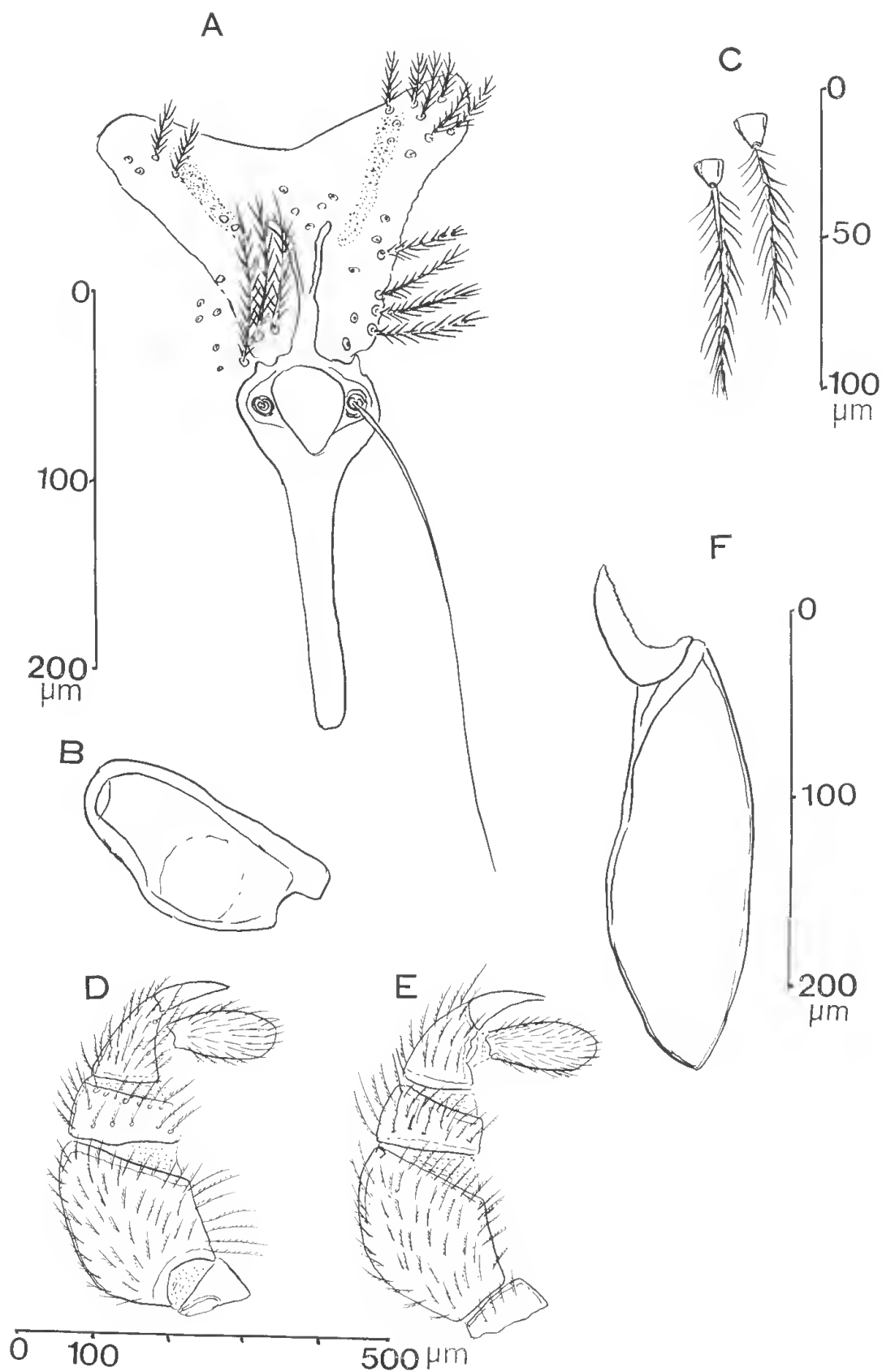


FIGURE 8. *Paratrombium lindsayi* sp. nov., adult female, paratype. A, Crista. B, Ocular peduncle. C, Two posterior dorsal idiosomal setae. D, Palp, dorsomedial aspect. E, Palp, ventrolateral aspect. F, Chelicera. (Each to nearest scale.)

with a leash of setules in distal half. MA/AP 1.84–2.29.

*Diagnosis of adult*

PDS to 80 µm long.

*Description of larva*, slide-mounted (from holotype, supplemented by paratypes) (Figs 5, 6A–F)

Colour in life red. Idiosoma ovoid, length 367, width 230; total length 417.

Dorsal scutum approximately square in outline, with rounded angles. Margins smooth, anterior margin convex, lateral margins weakly concave, posterior margin convex. Scutum finely porose, the only special markings being an oblique pleat laterally, anterior to middle of scutum, and a few curved striae anterior to it. AM setae smooth, pointed, tusk-like; AL and PL setae tapering, pointed, with a few slender, pointed setules. Sensillary setae filiform, with a few slender, distal setules.

Each eye pair near posterolateral border of scutum; anterior eye 11 across, posterior 8.

Metric data as in Table 3.

Scutellum transverse, with smooth margins; anterior border almost linear, posterior border strongly convex, lateral angles rounded; scutum porose, without special markings; scutalae similar to AL and PL scutalae of anterior dorsal scutum.

Dorsum of idiosoma behind scutellum with 20 setae, tapering, pointed, with a few lightly outstanding setules; setae arranged 2, 2, 6, 2, 4, 2, 2 (pygosomals).

Ventral surface of idiosoma (Fig. 6A): two setae (intercoxalae) between medial ends of coxae III, slender, tapering, setulose, 45 long, with long, pointed setules. Behind coxae III are setae similar to dorsals, 54–57 long, arranged 2, 4 (+ two pygosomals).

Legs of usual stature for genus; lengths (including coxae and claws) I 410, II 360, III 410. Coxa I with medial coxala I arising towards anterolateral angle, 71 long by 27 wide where widest, with *c.* 27 digitations (Fig. 6B), the proximal digitations arising almost at right angles to axis, distal ones arising more obliquely, all pointed; lateral coxala I arising close to anterolateral angle of coxa, 73 long, curved, pointed, well setulose with long setules; originating above posterior cornu of coxa-trochanteral joint a fine, pointed, simple seta (supracoxala), 15 long. Urstigma oval, 36 x 13, at posterolateral angle of coxa I. Coxa II with two pointed, setulose setae, each 55 long, anterior

arising near anterolateral angle of coxa, posterior near posterolateral angle. Coxa III with a similar seta, 58 long. Leg setae pointed, setulose. Scobalar formula (legs I, II, III): Fe 5, 4, 4, Ge 4, 3, 3, Ti 5, 5, 5.

Leg specialized setae: SoGel.24ad(42), SoGel.50ad(33), VsGel.77pd(*c.*7), SoTil.54d(24), SoTil.81d(24), VsTil.93pd(*c.*7). SoGell.45p(45), VsGell.81pd(7) SoTill.21d(34), SoTill.50pd(25). SoGell.32d(40).

Tarsus I with SoTal.56d(25), FaTal.55ad(1), SeTal.78d(43) ('tectal eupathidala'), Pt 11 long. Tarsus II with SoTall.48d(18), FaTall.48pd(1). Tarsal claws and empodium as in *P. australe*.

Gnathosoma: chelicerae bases spindle-shaped, 73 long by 55 wide (combined); cheliceral digits slender, 58 long, with 'chisel end' 13 long. Protostralar setae (Fig. 6C) simple, curved, pointed, 8 long; deutrostrals absent; tritrostrals (Fig. 6D) curved, 32 long, with a brush of setules in distal 2/3. A minute, slender supracoxala, 7 long, behind posterolateral border of palpal trochanter (Fig. 6B). Palpal femur with slender, simple, pointed dorsal seta 13 long. Palpal tibia with three simple, slender, pointed setae. Odontus strongly curved, with two divergent tines. Palpal tarsus (Fig. 6E,F) with seven pointed setae, of which two are scythe-like; also a short peg-like projection, ?solenoidala.

*Description of adult female* (from paratype ACB549A, slide-mounted, largely disarticulated, but reconstituted from morphology and sizes of leg segments) (Fig. 7, 8A–F)

Colour in life red. Idiosoma more or less cordate, 1420 long by 1075 wide; length to tip of cheliceral blades 1480.

Crista (Fig. 8A) well-developed, with typical vomer spreading from anterior part; in its anterolateral part vomer carries well setulose setae 40–50 long; in its more posterior part setae are up to *c.* 80 long. Sensillary setae filamentous, originating from a well-developed boss.

Dorsum of idiosoma thickly invested with tapering, well setulose setae (Fig. 6C) Eye peduncles well developed, each with two eyes (Fig. 6B), one at middle of peduncle 64 wide, the other terminal, *c.* 64 wide.

Metric data as in Table 4.

Ventral surface of idiosoma with setation similar to dorsal. External genitalia and anus partly obscured in specimen.

Legs of normal trombidoid stature; leg lengths (trochanters to claw-tips; estimated from reconstituted specimen by fitting drawings): I

TABLE 3. Metric data of *Paratrombium lindsayi* sp. nov. larvae (\*for maximum values).

Character	Holotype	n	range	mean	s. d.	c.v.
LN	22	8	18-24	21.5	2.07	9.6
MA	103	8	97-107	102.9	2.80	2.7
AW	157	8	151-162	156.6	3.46	2.2
PW	169	8	155-169	161.6	4.47	2.8
SB	141	8	132-142	137.4	3.46	2.5
MSA	93	8	91-95	92.5	1.31	1.4
ASB	146	8	140-149	146.3	3.92	2.7
PSB	40	8	40-48	43.8	2.60	6.0
L	186	8	184-196	190.0	5.10	2.7
W	212	8	205-217	211.6	4.21	2.0
AP	45	8	45-56	52.3	3.37	6.4
SA	39	8	34-39	35.6	1.77	5.0
SP	22	8	21-25	22.6	1.19	5.2
AM	40	8	40-51	44.4	3.46	7.8
AL	55	8	48-57	53.0	3.55	6.7
PL	80	8	77-82	78.6	1.92	2.4
AMB	54	8	49-59	54.1	2.95	5.4
SE	60	8	80-92	88.6	4.00	4.5
PLN	c. 35	8	27-38	35.1	4.02	11.4
PSL	c. 55	8	46-69	59.3	6.50	11.0
PSW	c. 189	8	176-192	182.3	6.18	3.4
QW	59	8	54-60	57.1	2.30	4.0
QL	82	8	77-83	80.0	2.39	3.0
DS	75-125	8	109-127*	117.8*	7.01*	5.9*
MDS	75	8	66-76	74.0	3.25	4.4
PDS	125	8	109-127	117.8	7.01	5.9
AW/QW	2.66	8	2.57-2.89	2.72	0.0997	3.7
PSL/PLN	c. 1.57	8	1.57-1.78	1.69	0.0614	3.6
Fel	74	8	69-77	73.9	2.59	3.5
Gel	45	8	42-48	44.3	2.19	4.9
Til	70	8	66-73	70.0	2.83	4.0
Tal(L)	91	8	86-91	90.0	1.77	2.0
Tal(H)	29	8	26-31	28.9	1.46	5.0
Til/Gel	1.56	8	1.47-1.74	1.59	0.100	6.3
Fell	62	8	59-64	60.9	3.09	5.1
Gell	40	8	35-40	36.6	1.51	4.1
Till	62	8	58-63	60.4	2.07	3.4
Tall(L)	76	8	73-80	76.8	2.05	2.7
Tall(H)	22	8	20-23	22.1	1.13	5.1
Til/Gell	1.55	8	1.55-1.75	1.65	0.060	3.7
Felll	69	8	64-70	67.3	2.38	3.5
Gelll	44	8	37-45	41.4	2.50	6.1
Tilll	73	8	69-75	71.8	2.05	2.9
Talll(L)	84	8	78-86	82.4	2.72	3.3
Talll(H)	22	8	18-22	20.1	1.25	6.2
Tilll/Gelll	1.66	8	1.53-1.95	1.74	0.123	7.1
SA/SP	1.77	8	1.36-1.77	1.58	0.120	7.6
AW/AMB	2.91	8	2.68-3.16	2.90	0.169	5.8
QL/QW	1.39	8	1.28-1.50	1.40	0.0676	4.8
PSW/QW	3.20	8	3.00-3.40	3.19	0.119	3.7
MA/AP	1.87	8	1.84-2.29	1.95	0.150	7.6

TABLE 4. Metric data of *Paratrombium lindsayi* sp. nov., adult, compared with adult *Paratrombium nynganense* (Hirst). (<sup>A</sup> Data from Hirst (1928a). <sup>B</sup> Figures in parenthesis are derived from the disarticulated segments, after reconstitution and re-assessment of the largely disarticulated specimen. <sup>C</sup> Womersley (1934). CL = crista length; VW = vomer width).

Specimen	<i>Paratrombium lindsayi</i> ACB549A <sup>B</sup>	<i>Paratrombium nynganense</i>
Character		
CL	352	
VW	195	
ASB	165	
PSB	187	
SB	50	
SE	210	
EPL	128	
EPW	75	
MDS	—	
PDS	75–80	65 <sup>C</sup>
Gel	(373)	
Til	(432)	260 <sup>A</sup>
Tal(L)	(565)	350 <sup>A</sup>
Tal(H)	(203)	120 <sup>A</sup>
Til/Gel	(1.16)	—
Tal(L)/Til	(1.31)	1.35 <sup>A</sup>
Tal(L)/Tal(H)	(2.78)	2.92 <sup>A</sup>
Gell	(245)	
Till	(360)	
Tall(L)	320	
Tall(H)	139	
Till/Gell	(1.47)	
Tall(L)/Till	(0.89)	
Tall(L)/Tall(H)	2.30	
Gelll	(237)	
Tilll	(380)	
Talll(L)	(290)	
Talll(II)	(138)	
Tilll/Gelll	(1.60)	
Talll(L)/Tilll	(0.76)	
Talll(L)/Talll(H)	(2.10)	
GclIV	(346)	
TilIV	(530)	
TalIV(L)	324	
TalIV(II)	140	
TilIV/GclIV	(1.53)	
TalIV(L)/TilIV	(0.61)	
TalIV(L)/TalIV(II)	2.31	

2145, II 1605, III 1405, IV 1900. Tarsal claws as described for *P. australe*.

Gnathosoma: combined chelicerae bases spindle-shaped, *c.* 200 long by 73 wide; cheliceral digits robust, 80 long, with fine, dorsal retrorse denticles (Fig. 8F). Palpi (Fig. 8D,E) robust, well covered with pointed, setulose setae; palpal tibial odontus as for *P. australe*, 130 long, without paradonts or spinisetae. Palpal tarsus 155 long by 64 wide, with numerous fine, setulose setae.

#### Description of Ovum

Red, spheroidal, smooth, size (estimated from cast ova skins) about 350 long by 250 wide.

#### Description of Deutovum

Colour red; dimensions not measured; no unusual features noted.

#### Etymology

The species is named for the collector, then aged 12 years.

#### Biology

**Experiment ACB549:** An adult female was captured on 28.x.1951, and confined in a small tube with some soil from the capture site. At the next observation, on 25.xi.1951, the adult was dead and the tube contained a 'Batch of red, smooth, spheroidal eggs'. On 5.xii.1951 all ova had developed to the prelarva stage; a few were mouldy. On 10.xii.1951 all had emerged to larvae. On 11.xii.1951 it was recorded that the larvae tended to aggregate in groups. An adult lacewing (Chrysopidae) placed in the tube was not parasitized by the larvae. By 16.xii.1951 all larvae had died.

The adult had been left in the tube, and had decomposed, the legs being largely disarticulated. Adult and larvae were mounted by standard procedures. The legs of the adult were mostly in individual segments, which were mounted, later to be identified by shape and measurement. In the tube were five extra leg segments, two were of a conjoined tibia IV and tarsus IV, discrepant from the others, and three segments (trochanteral and femoral) not used in the metric data in Table 4. It is assumed that the original soil used was contaminated by extra leg segments of another trombidoid mite.

#### Comment on the taxonomy of *Paratrombium australe* and *P. lindsayi*

**Larvae:** The two reared populations of larvae of *P. australe* (ACB294 and ACB585) show similar

morphological features, and in addition the metric data show overlapping ranges in almost all of the dimensions measured, so that their specific identity need not be questioned.

In the case of the larvae of *P. lindsayi* there is almost no overlap of the dimension ranges with those of the two populations of *P. australe*. Thus the shield dimensions AW, PW, SB, AMB and PSL are significantly larger, while others, such as AP, SP, PDS and most leg dimensions are significantly smaller. Additionally, the medial coxala I of *P. lindsayi* has *c.* 27 digitations, while the medial coxala I of *P. australe* has 15–20 digitations.

**Adults:** As only two adults of *P. australe* and one of *P. lindsayi* from which larvae have been reared are available, conclusions based on general morphology and metric dimensions need to be more guarded, particularly as one female of *P. australe* was significantly larger than the other. Nevertheless in nearly all cases the dimensions of the adult females of *P. australe* were significantly larger than those for the female of *P. lindsayi*. There are also several differences in the various dimension ratios between the two species (see Tables 2 and 4).

The relations between these adults and other adults allotted to the genus are conjectural. Each of them can be placed in the key to the adults given by Womersley in 1934 (as *Caenothrombium*); the nearest fit being between *P. lindsayi* and *P. nynganense* (Hirst). Even so, the length of tibia I of *P. nynganense* (from Hirst (1928a)) is only 60% of that of *P. lindsayi*, and only 54% or 58% of that of *P. australe*, while the length given of the dorsal idiosomal setae by Womersley (1934) as 65 is significantly shorter than that of *P. lindsayi* (75–80). (See also the Remarks on post-larval *Paratrombium*, below.)

***Paratrombium curculionis* sp. nov.**  
(Figs 9, 10A–F)

#### *Material examined*

Holotype. Queensland. Wongabel, September 1944, R. N. McCulloch, larva ACBI303, ectoparasitic on a weevil (Coleoptera, Curculionoidea).

#### *Diagnosis of larva*

Scutellum with two setae. Posterior claw of tarsus III not reduced. AM setae slender. Medial coxala I with 12–13 digitations. Odontus strongly curved, almost circular. SB < 150 µm. AW < 150 µm.

#### *Description of larva* (from holotype, slide-mounted)

Colour in life red. Idiosoma 300 long, 205 wide; total length to tip of cheliceral blades 335. Anterior dorsal scutum with smooth borders; anterior border with a slight central concavity (a presumed artefact of mounting); other borders convex except for a weak emargination near the posterolateral angles to accommodate eyes; posterolateral angles rounded. AM setae slender, curved, simple, pointed; AL scutalae stout, tapering, pointed, with a few distal setules; sensillary setae filiform, with a few slender, distal setules. PL scutalae (missing in specimen) arise at PL angles of scutum.

Each eye pair placed near posterolateral border of scutum; corneae circular, anterior 11 across, posterior 9.

Scutellum porose; margins smooth; anterior margin slightly convex; lateral and posterior margins convex; scutalae stout, moderately setulose.

Metric data as in Table 5.

Dorsal idiosomal setae behind scutellum about 20 in number; each seta arises from a small conical papilla; setae stout, blunt-ended, with slender setules in distal half; arranged 2, 2, 6, 4, 4, 2 (pygosomals).

Ventral surface of idiosoma: between coxae II two slender setae, 40 long, pointed, with slender distal setules. Behind coxae III about eight setae, similar to dorsals, 54–60 long, arranged 2, 4 (+ two pygosomals).

Legs of normal stature, short, lengths (including coxae to claws): I 330, II 315, III 335. Leg scobalae pointed, simple, except for a few distal setules. Coxa I stout, triangular, with rounded medial end, carrying a medial pectinate seta 42 long with *c.* 13 slender digitations, arising obliquely, the longest of these arising about 2/3 along coxala (Fig. 10B). Lateral coxala I arises near anterolateral angle of coxa, stout, pointed, curved, setulose, *c.* 55 long. Dorsally above the posterior cornu of the coxal joint a slender, pointed supracoxala, 16 long (Fig. 10D). Urstigma narrow, oval, 31 long by 8 wide, on posterolateral part of coxa I. Coxa II carries two stout, pointed, lightly setulose setae, anterior 64 long, posterior 55. Coxa III with a similar seta 58 long. Scobalar formula (legs I, II, III): Fe 5, 4, 4, Ge 4, 3, 3, Ti 5, 5, 5.

Leg specialized setae: SoGel.32pd(40), SoGel.45d(36), VsGel.76pd(6), SoTil.47d(25), SoTil.78ad(24), VsTil.83pd(6), SoGelI.25d(30), VsGelI.66d(9), SoTilI.31d(30), SoTilI.69d(18), SoTilI.30p(40).

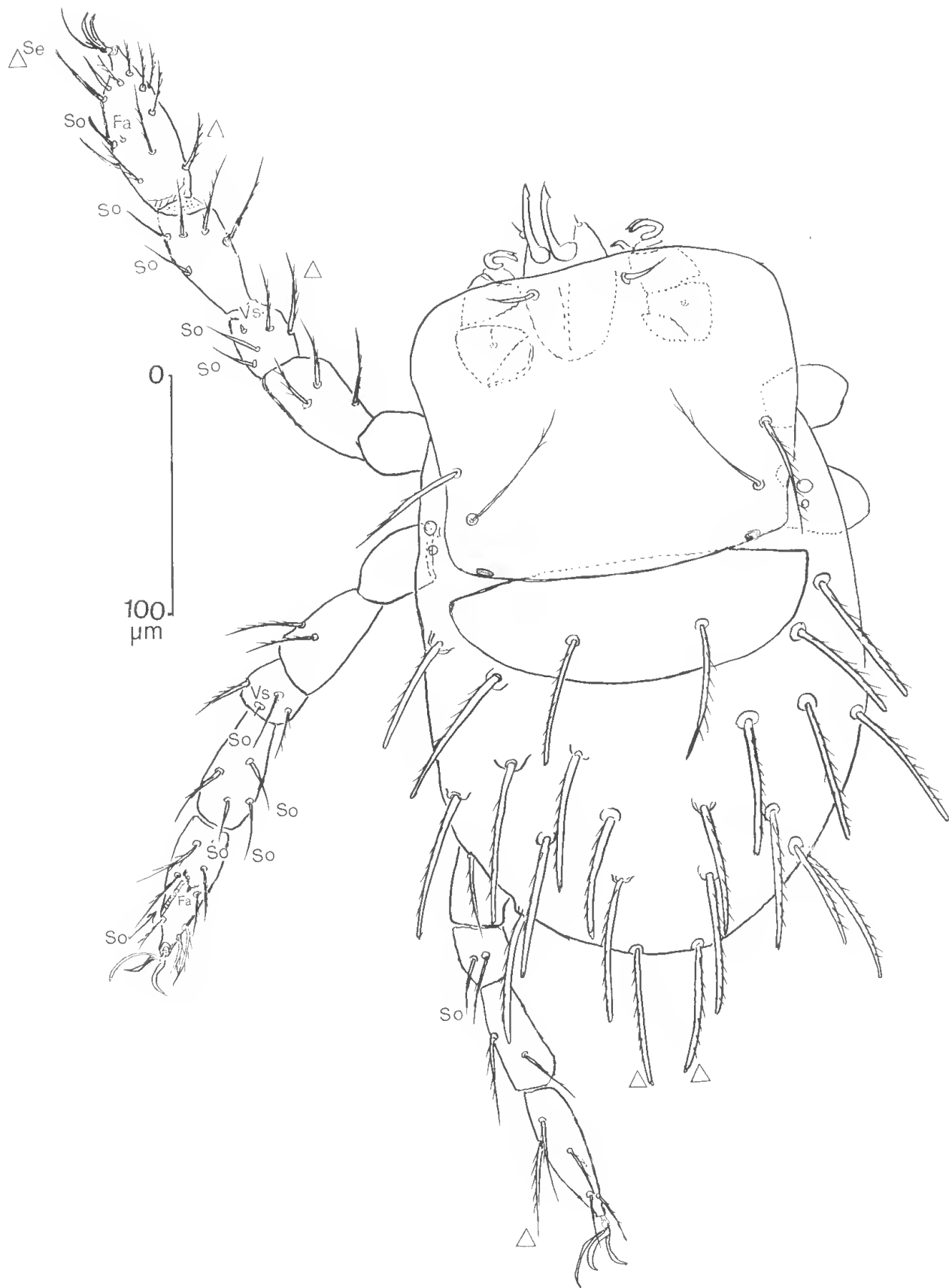


FIGURE 9. *Paratrombium curculionis* sp. nov., larva, holotype. Dorsal view. to standard symbols; on right, legs omitted beyond trochanters.

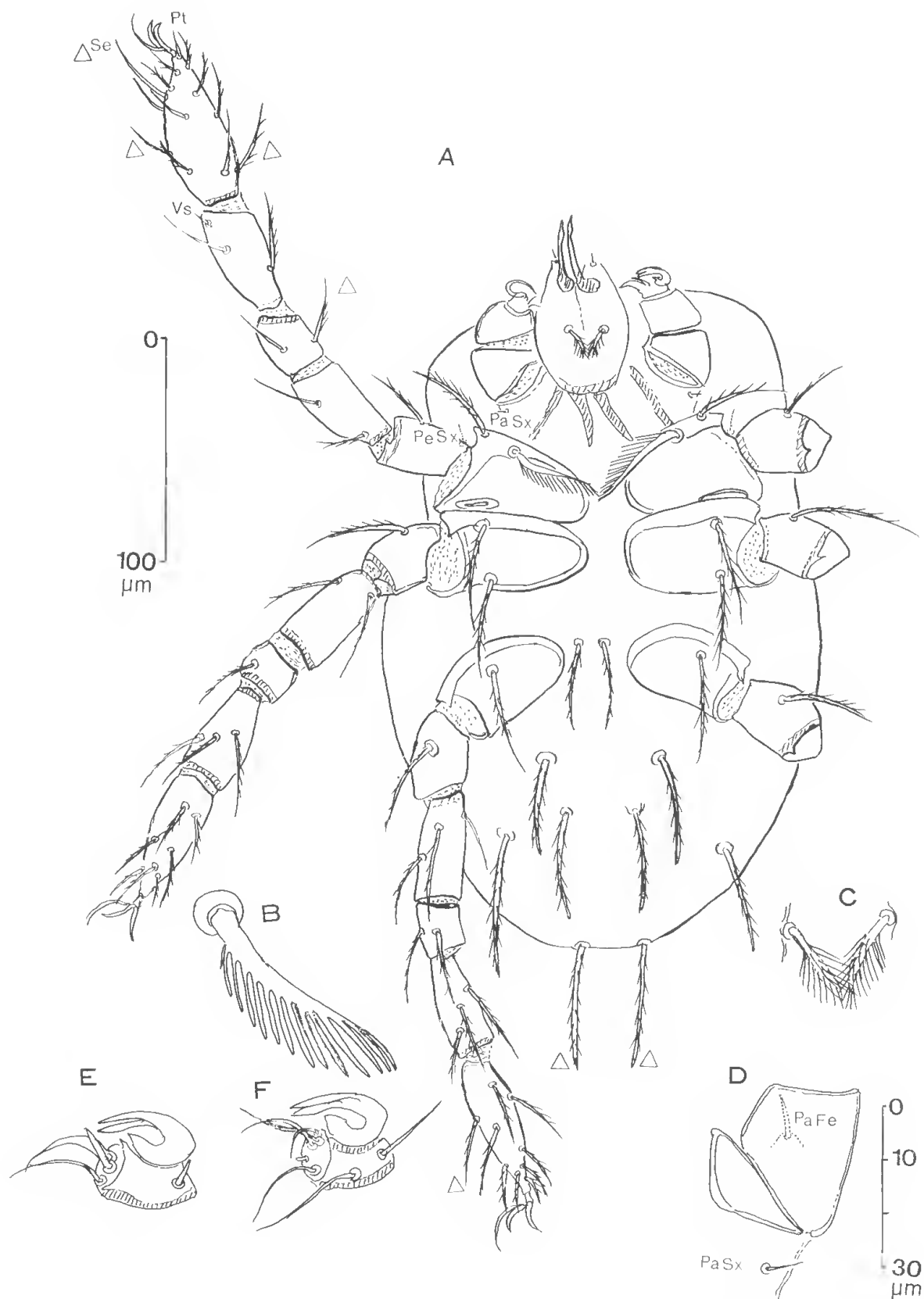


FIGURE 10. *Paratrombium curculionis* sp. nov., larva, holotype. A, Ventral view: on right, legs omitted beyond trochanters. B, Medial coxala I. C, Tritorostral setae. D, Ventral aspect of palpal femur and trochanter. E, Palpal tibia and tarsus, dorsomedial aspect. F, Same, ventrolateral aspect. (To standard symbols; additionally: PaFe palpal femoral, dorsal, shown in stipple in D; PaSx palpal supracoxala; PeSx pedal supracoxala, dorsal, shown in stipple in A.) (A to scale on left; B–F to scale on right.)



TABLE 5. Metric data for holotypes of *Paratrombium curculionis* sp. nov. and *Paratrombium anemone* sp. nov. (larvae)

Character	<i>Paratrombium curculionis</i>	<i>Paratrombium anemone</i>
LN	15	23
MA	82	87
AW	129	144
PW	110	144
SB	122	123
MSA	68	68
ASB	109	110
PSB	33	45
L	142	155
W	160	167
AP	38	38
SA	23	23
SP	18	21
AM	18	27
AL	42	55
PL	—	73
AMB	39	34
SE	64	—
PLN	28	18
PSL	53	36
PSW	149	160
QW	56	53
QL	62	82
DS	66–68	66–71
MDS	66	66
PDS	68	71
AW/QW	2.30	2.72
PSL/PLN	1.89	2.00
FeI	57	66
Gel	31	36
Til	57	59
Tal(L)	74	84
Tal(H)	28	25
Til/Gel	1.84	1.64
FeII	52	62
Gell	26	33
TilI	46	57
TaII(L)	66	69
TaII(H)	23	23
TilI/Gell	1.77	1.73
FeIII	57	66
GellI	29	34
TilII	54	68
TaII(L)	70	76
TaII(H)	21	19
TilII/GellI	1.86	2.00
SA/SP	1.28	1.10
AW/AMB	3.31	4.24
QL/QW	1.11	1.55
PSW/QW	2.66	3.02
MA/AP	2.16	2.29

Tarsus I with SoTal.47d(20), FaTal.48ad(3), SeTal.69d(40), Pt 11 long. Tarsus II with SoTalI.43–.44d(20), FaTalI.48–.40pd(2) Claws of all tarsi smooth, falciform, equal; empodium over-reaching claws.

Gnathosoma: chelicerae compact, bases about 55 long by 45 wide (combined); cheliceral digits slender, curved, 39 long, with terminal blade 12 long. Protorostral setae simple, pointed, 7 long. Deutorostrals absent. Tritorostral setae Fig. 10C) curved, 16 long, with brush-like expansion of setules in distal half. Behind posterolateral border of palpal trochanter a slender, simple supracoxala, 8 long. Palpi stout. Palpal femoral seta simple, pointed, 10 long. Palpal tibia (Fig. 10E,F) conical, with three simple, pointed setae; odontus strongly curved, almost forming a circle. Palpal tarsus with seven pointed setae, two deflexed. Palpal supracoxala posterolateral to palpal trochanter, simple, pointed, 8 long.

#### Etymology

The specific name *curculionis* is a noun in the genitive (Latin), signifying 'of a weevil' (host).

#### *Paratrombium anemone* sp. nov.

(Figs 11, 12A–E)

#### Material examined

Holotype. Papua New Guinea, Babiang, 19.xii.1944, R.V. Southcott, larva ACB267, caught free-living in damp soil. SAM.

#### Diagnosis of larvae

Scutellum with two setae. Posterior claw of tarsus III not reduced. AM setae slender, not tusk-like. Odontus almost straight, axial to palpal tibia. Tritorostral setae expanded, with several large blunted digitations. Medial coxala I with *c.* 17 digitations.

#### Description of holotype larva, slide mounted.

Colour in life red

Idiosoma *c.* 300 long by *c.* 200 wide; total length to tip of cheliceral blades *c.* 320.

Anterior dorsal scutum more or less oblong, finely porose, without special markings. Margins smooth; anterior margin with shallow median indentation (possibly an artefact of mounting); shape of lateral margins indeterminate from probable distortion in mounting; posterior margin weakly convex. AM setae slender, simple, pointed. Other scutalae stronger, pointed, simple except for slight terminal setules. Sensillary setae missing in specimen.



FIGURE 11. *Paratrombium anemone* sp. nov., larva, holotype, to standard symbols; legs omitted on left. The specimen is somewhat distorted, and the pattern drawn of post-seutellar dorsal setae is somewhat interpretative.

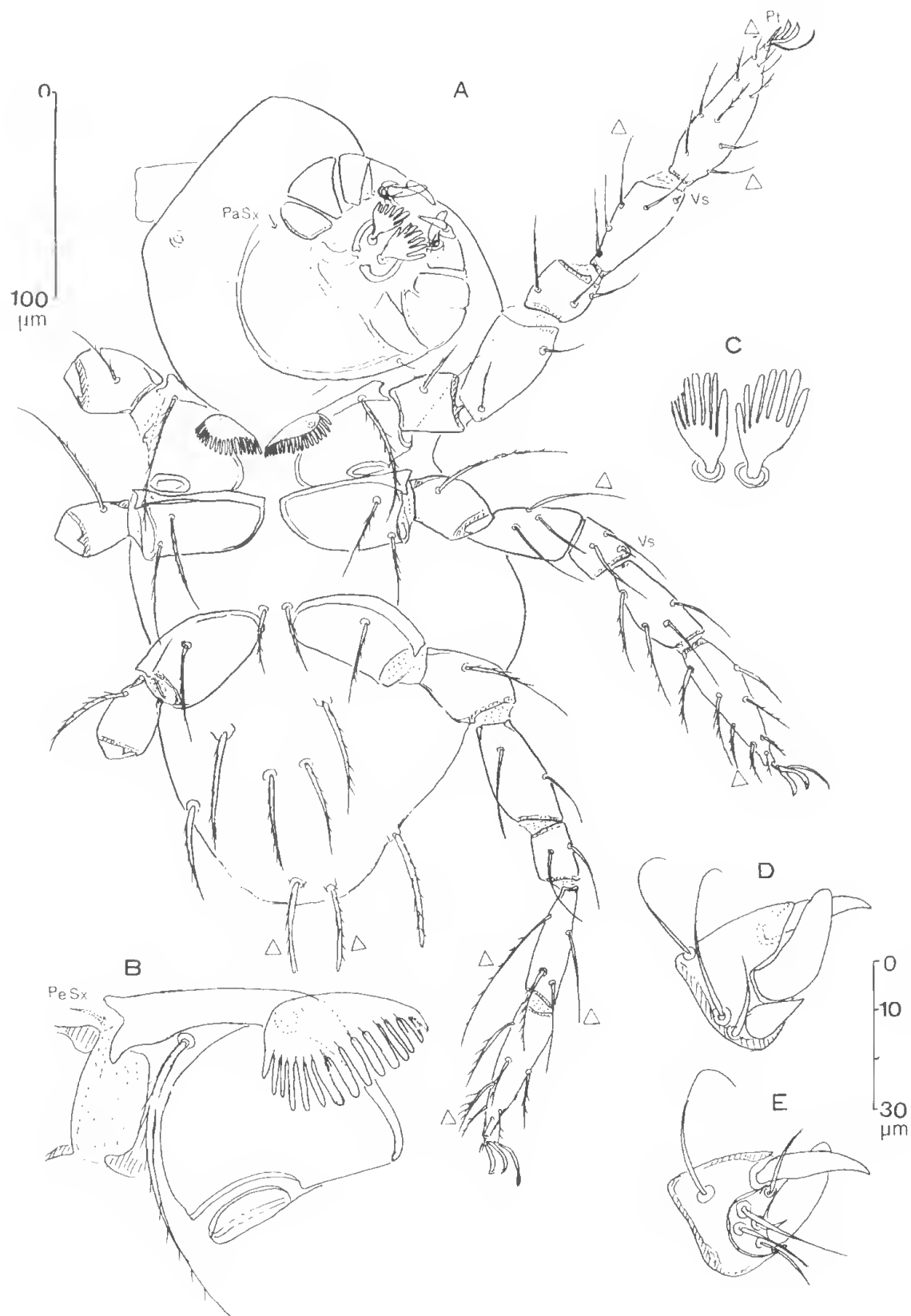


FIGURE 12. *Paratrombium anemone* sp. nov., larva, holotype, to standard symbols. A, Ventral view, legs omitted on left. The specimen is somewhat distorted, and the pattern drawn of hysterosomal setae somewhat interpretative; PaSx palpal supracoxala. B, Coxa I, ventral aspect, and adjacent structures; PeSx pedal supracoxala (dorsal), shown in stipple. C, Tritorostral setae. D, Palpal tibia and tarsus, dorsomedial aspect. E, Palpal tibia and tarsus, ventrolateral aspect. (A to scale on left; B–E to scale on right.)

Eyes near posterolateral border of scutum, anterior 9 across, posterior 7.

Scutellum porose, narrow, transverse; anterior border linear, anterolateral angles acute, at about 60°; posterior border convex; the two scutalae tapering, pointed, simple except for slight setules in distal half.

Metric data as in Table 5.

Dorsum of idiosoma behind scutellum with *c.* 19 setae, pointed or blunt-pointed, with slender, pointed setules; setae arise from hemispherical papules; precise arrangement uncertain from distortion of specimen.

Ventral surface of idiosoma: between coxae III two slender, pointed, lightly setulose setae, 45 long, arising from papules. Behind coxae III *c.* eight setae, arranged 2, 4 (+ 2 pygosomals); setae similar to dorsals, 70–75 long.

Legs of usual trombidoid larval stature; lengths (including coxae and claws): I 365, II 350, III 375. Coxa I (Fig. 12A) forms a quarter-circle with a projecting anterolateral articular piece. At about the anteromedial position medial coxala I arises, comma-shaped, 38 long by 21 wide, with a row of 16–17 blunt-ended digitations, coming off at about a right angle to the main axis; the digitations are longest at about the middle of the array (Fig. 12B). At about the anterolateral position a strong, pointed lateral coxala I, about 60 long, with fine, pointed setules. Above the anterior cornu of coxa I is a fine, pointed, simple supracoxala, 13 long. Urstigma 21 x 9 present, set in the posterolateral angle of coxa I. Coxa II with two setae, tapering, pointed, with slender setules; anterior seta 60 long, posterior 50. Coxa III with a similar seta, 62 long. Leg scobalae similar, with slender setules; scobalar formula (legs I, II, III): Fe 5, 4, 4, Ge 4, 3, 3, Ti 5, 5, 5.

Leg specialized setae: SoGel.15d(46), SoGel.31ad(53), VsGel.85pd(5), SoTil.54d(30), SoTil.70d(22), VsTil.84pd(7), SoGell.34d(70), VsGell.76ad(5), SoTill.20d(38), SoTill.53d(53), SoGell.25d(75).

Tarsus I with SoTal.33d(31), FaTal.45ad(3), SeTal.68d(47), Pt 14 long. Tarsus II with SoTall.37d(18), FaTall.41pd(3). Tarsal claws falciform, smooth, equal over legs I–III; empodium of each tarsus slender, over-reaching the lateral claws.

Gnathosoma: chelicerae compact, bases *c.* 70 long by 50 wide (combined). Protorostral setae not identified. Deutorostrals absent. Tritorostrals (Fig. 12C): each seta expanded to a set of seven round-ended digitations; setae *c.* 27 long. Palpal femoral seta slender, pointed, simple, 16 long.

Palpal tibia with three simple, pointed setae (or four, anomalously), proximal; also a strong, pointed, undivided odontus, projecting axially. Palpal tarsus with two large, sclerotized ventromedial projections, evidently modified setae; proximal one short and conical, the larger one cucumber-shaped (see Fig. 12D,E), and reaching as far anteriorly to almost the tip of the odontus; also five fine, simple, pointed setae; no solenoidala detected. Palpal supracoxala slender, spiniform, 6 long.

#### *Etyymology*

The specific name *anemone* is a noun in apposition, of classical Greek origin, which refers to the zoophyte-like appearances of the tritorostral setae.

#### *Remarks*

*Paratrombium anemone* differs from other described larvae placed in the genus in having spreading, digitate tritorostral setae, and in detailed structure of the palpal tarsus. The latter has two large sclerotized projections, which are presumably modified setae. The more characteristic scobalae of the palpal tarsus appear normal in being slender, simple, pointed, but are without modification into scythe-like forms.

#### REMARKS ON POST-LARVAL *PARATROMBIUM*

Six species of *Paratrombium* have been correlated between larvae and adults by experimental rearing from ova laid by females; two European, two North American and two Australian. These rearings confirm the placing of *Paratrombium* in the Trombidiinae, and allow the corrections of generic placements of earlier authors of Australian adult Trombidiidae. Of those placed in *Caenothrombium* Oudemans, 1927 by Womersley (1934), after the earlier placement of *Caenothrombium miniatum* Womersley, (1934) in *Pollicotrombium* Southcott, 1986 as *P. miniatum* (Womersley) (see Southcott 1986), the following new combinations may be assigned:

*Paratrombium album* (Womersley, 1934: 204), comb. nov.,

*P. angustae* (Hirst, 1928b: 1032), comb. nov.,

*P. crassum* (Hirst, 1928a: 567), comb. nov.,

*P. montivagum* (Hirst, 1928b: 1027), comb. nov.,

*P. nobile* (Hirst, 1928b: 1932), comb. nov.,

*P. nynganense* (Hirst, 1928a: 566), comb. nov.,

*P. rainbowi* (Hirst, 1928b: 1031), comb. nov.,

*P. sericatum* (Rainbow, 1906: 158), comb. nov.,

*P. splendidum* (Hirst, 1928a: 566), comb. nov.,  
*P. taylora* (Hirst, 1928b: 1034), comb. nov.,  
*P. torridum* (Hirst, 1928a: 567), comb. nov.,  
*P. ventricosum* (Hirst, 1928b: 1032), comb. nov.

Some of these species were synonymized by Womersley (1934), with little discussion; however, a key was provided.

One point of interest in adult chaetotaxy is that European *P. megalochirum* (Berlese, 1910) (see Berlese 1912) and *P. divisipili* (Feider, 1950)

(q.v.) have thickened dorsal idiosomal setae, while the North American adults described by Newell (1958), and the recorded Australian adults have slender, pointed dorsal idiosomal setae.

## ACKNOWLEDGMENTS

The work has been supported by the Australian Biological Resources Study.

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